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MINERAL LOCALITIES OF PHILADELPHIA AND VICINITY.

BY THEODORE D. RAND, WILLIAM W. JEFFERIS AND

J. T. M. CARDEZA, M. D.

The vicinity of Philadelphia has long been famed for the number of its mineral localities and the remarkable abundance and variety of species and specimens. The fact that these have been found chiefly in mining and quarrying operations of limited extent, many of them of short duration, added to the fact that the region has rapidly filled up with a dense population, so that noted localities have been covered with buildings, while others have apparently been exhausted, led one of the writers to suggest that those most familiar with the occurrence of these minerals during the last half century should publish jointly, and in connected form, an account of the localities more nearly complete than any now existing.

In doing this each has taken the region with which he is most familiar, assisted, however, by the others. No mineral has been mentioned without qualification unless known to one of the writers to have been found at the locality. It is believed that few omissions will be found, but the authors will be thankful for further information from any one knowing additional facts, and such facts will be incorporated in a subsequent paper with due credit.

The authors desire to express their acknowledgment to Messrs. Samuel Tyson, John Smedley, Joseph Willcox, Edward D. Drown and Lewis Woolman for valuable information incorporated in these notes.

THE MINERALS OF PHILADELPHIA AND THE TERRITORY ADJOINING ON THE NORTHWEST.—BY THEO. D. RAND.

A large part of Philadelphia is covered with the Delaware River gravels and clays, but most of the streams have cut through this covering and have exposed the underlying rocks. Owing to the demand for building materials many quarries have been opened, but few of any great extent. The sites of many of these are now covered by buildings. The rocks underlying the gravels and clays are gneisses and mica schists, usually with a strike of about N. 60° E. and a generally northwardly dip; they are often decomposed to a considerable depth. Their best exposure is along the Schuylkill River. Ascending the Schuylkill, the first exposure occurs at Gray's Ferry: a decomposed, highly feldspathic gneiss, of which the feld-

spar has become kaolin and the mica, in some cases, a vermiculite. Mill Creek flows into the Schuylkill River about three hundred yards above Gray's Ferry, and on its banks some quarrying has been done in the mica schist, but no minerals were found except apatite and albite in poor specimens. In the sand of the Schuylkill above Gray's Ferry, and probably elsewhere, small zircons occur.

On mica schist rocks near Gray's Ferry, exposed in a cut of the Philadelphia, Wilmington and Baltimore R. R., an efflorescence proved to be glauberite but it is possible that this may have been derived from the gunpowder used in blasting.

The mica schists continue about two miles up stream to Fairmount, whose bold hill is composed of a gneiss which apparently rises as an anticlinal through the schists and is exposed by erosion. On the western side of the river this rock was largely quarried. The first quarry opened was immediately on the river bank. When the inclined plane was abandoned the Pennsylvania Railroad made a curved cut through these rocks extending from about 30th Street to 34th Street, and a large quarry, or a series of quarries afterwards merged into one, was opened on the southwest side of the railroad. Subsequently the bluff between the railroad and the river was largely quarried away, leaving an almost vertical wall of some fifty feet in height. This gneiss, identical with that found on Ridley and Crum Creeks in Delaware County, contained segregated masses of coarse orthoclase-albite-muscovite-granite. In this granite most of the minerals were found. Those identified are as follows:

Orthoclase in fine crystals, nearly all obtained from one highly quartzose granite bed near the river.

Albite, found with the orthoclase, but usually somewhat decomposed, and sometimes wholly converted into kaolin, the orthoclase remaining unchanged.

Tourmaline, black, in good crystals, sometimes terminated and sometimes large, but usually very brittle, so that good specimens were difficult to procure.

Beryl, rare and in small crystals, sometimes much decomposed.

Autunnite occurred in crystals and also as crystalline coatings loosely implanted on the rock. It was at times quite abundant and in very fine specimens. It was not usually in the granite but chiefly occurred in seams in the gneiss.

Chalcolite, perhaps a half dozen specimens were found associated with the autunnite.

Uranochre, one specimen, probably this species.

Garnet occurred, but the specimens were neither fine nor abundant. One specimen of transparent or precious garnet was found.

Chalcopyrite and malachite in poor specimens.

Bismuthinite, one specimen, was found in the granite on the river bank which afforded the fine orthoclase crystals. It is a small group of crystals imbedded in tourmaline.

Muscovite, biotite and pyrite and two specimens of hyalite colored yellow by uranium were found.

Northeast of Fairmount, along the line of the Reading Railroad, and to the north of the latter was high ground chiefly of gneiss, probably the same as that at Fairmount but much decomposed. In the granitic beds of this gneiss good crystals of muscovite occurred. All this region has long been built over.

Northwest of the Fairmount gneiss occur mica schists and hornblende schists which have been quarried along the Schuylkill and in West Philadelphia. The minerals found in this region are not numerous. On the left bank of the river about a quarter of a mile above Fairmount, a promontory of gneiss including some syenite formerly projected into the river, terminated by a rock covered during high water, known as Turtle rock. When the Park drive along the river was constructed, this rock was covered and the adjacent bluff partly quarried away. Here a few quite good specimens of chabazite were obtained, also hornblende in long bladed crystallizations.

Between Turtle rock and Girard Avenue bridge, bucholzite was formerly found.

In the mica schists of the tunnel in the Park north of Girard Avenue, and also in a quarry on Girard Avenue about 38th Street, menaccanite occurred in rough crystals. At the tunnel Mr. Howard Parker found a specimen in which three tabular crystals were curved into concentric semi-circles, the inner one with a diameter of two inches, the outer of three and a quarter inches. The crystals were about one-eighth of an inch in thickness with a quartz parting from 0 to $\frac{1}{8}$ of an inch; a separate flat crystal occupied the radius of the semicircle opposite the three. The exposed ends of these crystals were broken but they were evidently upwards of two inches in length along the axis of the semicircle.

At the quarry near 38th Street, one specimen contained six crystals within 3 x 4 inches, the crystals measuring upwards of an inch in length but being rough except upon the tabular surface.

On the Pennsylvania Railroad, about 36th Street, was a small quarry in mica schist. Here was found a rock formed of garnet in minute crystals of much brilliancy and of a yellowish-red color under the microscope but of a dark red in mass. It varied from almost pure garnet to a gneiss containing minute garnets.

In granitic veins or beds in these schists the mica is generally muscovite, intermixed with a very dark, nearly black mica, and the two occur intercrystallized, occasionally in remarkable specimens some of which are figured in the Report of the 2nd Geological Survey of Pennsylvania, Vol. C⁵. In much of the muscovite, hexagonal rhombs, invisible or rarely visible to the naked eye, appear under the microscope. On the northwesterly border of these schists bucholzite, forming a schist, is abundant, especially near Park Station, Schuylkill Valley Railroad. In a quarry south of the Station, and west of the railroad, chalcopyrite, malachite and chrysocolla occurred in hornblende gneiss interstratified in the bucholzite bearing mica schists.

Between these schists and the overlying gravel is frequently found a black friable conglomerate, the cement of which is wad containing cobalt. It can be found in many places.

Included in the mica schists are strata of hornblende gneiss, sometimes nearly pure hornblende. Immediately above the old Columbia Bridge in hornblende gneiss was the well-known laumontite locality. Good specimens were obtained on only two occasions, the first when an ice-house was built there about 1850 and the rock was quarried to make room for it and to build it, and many years subsequently, when the first ice house having burned down, a larger one was erected in its place. Mehlzeolite was abundant and may still be obtained, but well crystallized laumontite was rare. Good crystals, however, were obtained measuring over three-quarters of an inch in length, together with indifferent specimens of natrolite and heulandite and of crystallized quartz.

As an efflorescence on these hornblende rocks alunogen and halotrichite occur occasionally, but on the Pennsylvania Railroad at 59th street there was an old quarry in a peculiar pyritiferous gneiss and felsite. This quarry was opened for railroad ballast, for which purpose the rock was used to a considerable extent before its rapid

decomposition was known. At this point halotrichite was at times very abundant and in quite large masses, due to the fact that the rock in question seems to lie in a synclinal, the axis of which rises rapidly southwestward, forming on the northeast side a series of nooks protected by overhanging ledges, so that the halotrichite formed was protected from the weather. Associated with this is a subsulphate of iron, or iron sinter, probably glockerite, also alunogen.

Pebbles of many varieties of quartz, jasper, basanite, etc., have been found in the gravel which overspreads a large part of Philadelphia.

All the rocks mentioned above have a general northeast and southwest strike, but there is a belt of very hard gneiss extending from Frankford to the Wissahickon, with a strike nearly west, probably rising on the crest of an anticlinal wave or possibly an intrusive mass. This gneiss being hard and quite uniform, with a straight fracture, makes a valuable building stone, and it has been quarried at several points, at some quite largely. It varies in texture from a rather coarse granitic or syenitic gneiss to an almost cryptocrystalline felsite or granulite. Granite segregations are not common, but they are sometimes large and chiefly of orthoclase. The largest quarries of this are at Frankford. Here the minerals were finest and most abundant. Chief among these was stilbite, rarely in crystalline forms, usually in stellate radiations on the surface of what the quarrymen call "heads" in the gneiss, that is joint planes at right angles, or nearly so, to the bedding. This was very abundant, many tons of rock covered with it being exposed at a single blast, and some of it was beautiful, but, occurring as it did on this hard rock, and on faces at right angles to the cleavage, it was often difficult to procure specimens in the midst of great abundance. Fortunately, at times, there were subordinate joints close to the main one; these, too, would be filled with stilbite and along such line the rock would split easily. Usually the coating was very thin, almost immeasurable, but occasionally the joint would widen, and the stilbite would occur, half an inch or more in thickness. With the stilbite is associated, rarely, apophyllite in fine crystals some of them half an inch across, usually opaque glassy-white but sometimes colorless and transparent.

Molybdenite occurs imbedded in the gneiss, sometimes in large masses (one of over a pound weight of pure molybdenite) and also

in crystals which for perfection are probably unequalled. One of about the size of a pea is almost perfect on all sides, having the prism and two domes. One crystal, not perfect but showing five planes, measured $2\frac{1}{4} \times 4$ inches, and others, showing all the prismatic planes, $1\frac{1}{4} \times 2$ inches.

The minerals described occurred in the largest quarry, situated northeast of Frankford Creek and between Adams and Church Streets, chiefly towards the northern end of the quarry. In the gneiss at the extreme south end of this quarry was a bed of orthoclase in which was found the randite, usually as a very thin coating on orthoclase, sometimes in groups of microscopic acicular crystals, occasionally imbedded in calcite.

Some of the orthoclase of this quarry has a pink tint, due, as shown by the microscope, to minute crystals, probably of gothite. Tourmaline occurred in poor crystals and also as a rock-like mass coating the gneiss. Muscovite is found, but in poor specimens; also lepidomelane in large cleavable masses. Epidote and sphene, the latter in minute but perfect crystals, were found rarely.

In a small quarry, adjacent to the above, lying across Church Street, was a small bed of calcite in the gneiss containing fine crystals of epidote, some an inch or two long, terminated, and one, measuring $\frac{3}{4} \times 2\frac{1}{4}$ inches, showing prism faces only, but those brilliant and perfect. Crystallized hornblende was sometimes found but was rare. Hyalite containing uranium was also found.

Beside these the following were found in indifferent specimens: Iceland spar, chalcopyrite, bornite, malachite, chrysocolla, apatite, fluorite.

On Frankford Creek, above this quarry, there is a granite containing reddish orthoclase and greenish oligoclase.

In a small quarry on Little Tacony Creek west of Frankford Road apophyllite was found; the first place at which it was discovered in this vicinity.

In its westward strike this Frankford gneiss is next met with near Wayne Junction, Germantown. The railroad here crosses the turnpike, or Germantown Road, and formerly there was a large quarry in rock very like that of Frankford, except that near the surface it was much decomposed. This was the locality of the philadelphite which occurred as the mica in a schist, and also in small veins in the rock. From the occurrence deeper in the quarry of precisely similar veins of hornblende and the fact that the hard

hornblende gneiss of the lower part of the quarry seemed to decompose into the philadelphite schist near the surface, I think the philadelphite is due to the alteration of hornblende.

Except sphene and bornite I know of no other mineral found here. About a quarter of a mile further west in a road-cutting were large quantities of a feldspar, probably orthoclase containing imperfect crystals of a black mica, probably lepidomelane, frequently five or six inches in length and not over an inch across. Further west and close to the Wissahickon is the well known McKinney's quarry to which the attention of mineralogists was first called by the abundance of apatite. The gneiss here is very regular and of excellent quality. In a bed of feldspar met with about 1850 rough irregular crystals of apatite, some a foot long, were found abundantly. Besides this the following were found; natrolite, heulandite, laumontite, hornblende, bornite, chalcopyrite, malachite, chrysocolla, fahlunite, sphene and a micaceous mineral resembling philadelphite. Some of the laumontite was colored green by copper.

Northwest of the Philadelphia mica schists and gneisses, from the Schuylkill to near Morton Station, southeast of Media, extends an outcrop of porphyritic gneiss which appears to include some small schist areas, and this is followed by schists called by Mr. Hall the Manayunk schists, very similar to those on the southeast of the porphyry. Both the porphyry and the schists are very barren of minerals. The porphyry is, of course, full of feldspar (orthoclase) crystals usually if not invariably twinned, but it is impossible to detach them from the gangue, and nothing but sections can be had. In the porphyry, granitic segregations occur, composed chiefly of a reddish orthoclase making sometimes a graphic granite. Quartz is much less in quantity than the orthoclase, and mica (muscovite) even less than the quartz. Rarely in this granite occurs black tourmaline in poor specimens. Near West Laurel Hill Cemetery minute sphenes occur in the gneiss which is there very fine grained. Northwest of the bridge of the Reading Railroad over the Schuylkill at the Falls was formerly a large quarry in a gneiss resembling the Fairmount gneiss, but harder.

On the west bank of the Schuylkill, just above the Park bridge, is a quarry which at one time was largely wrought. The rock is not distinctly porphyritic, and is very variable in its different strata, passing from a highly felspathic gneiss to a mica schist, and from

hornblende gneiss to quartzite. This quarry only, among the large number in the porphyritic rock and adjacent schists, is worthy of the name of a mineral locality; no fine specimens were found, but the following occurred: quartz in modified crystals, epidote, magnetopyrite, calcite in dog-tooth crystals, krokidolite, garnet, laumontite, and coatings of halotrichite. On one occasion the sap from a broken root of an oak in the soil over the quarry had trickled down over the rocks whence the halotrichite effloresced, forming a black band of native ink. Rhodonite is reported to have been found in this quarry but I have not seen it.

Northwest of the Manayunk schists is another series, termed by Mr. Hall the Chestnut Hill schists. Both series contain numerous garnets but the Chestnut Hill schists contain them in largest quantity. They are very abundant, sometimes crystallized, rarely large, always dull and usually rough.

In both these schists occur outcrops of magnesian rocks. The most important of these, mineralogically, except possibly the outcrops near Media, is that which is known as the steatite belt which extends from Chestnut Hill, Philadelphia, to Bryn Mawr. It is well exposed on the Wissahickon but on the Schuylkill, at the northwesterly line between Philadelphia and Montgomery County, it has been largely quarried for over a century and has yielded quite a variety of minerals, as follows: talc, rarely in crystals, abundant massive and sometimes in beautiful green translucent specimens; dolomite, massive very abundant, sometimes good cleavage specimens associated with talc are obtained; it occurs also crystallized in the ordinary form of pearl spar, of which some beautiful specimens have been obtained, also in six-sided prisms with terminations, and rarely in a form very near a cube; breunnerite, in poor specimens, at the old soapstone quarry on the east bank of the river, but in crystals quite perfect and more than an inch across, at the quarry on the west bank; magnetite in octahedra in chlorite; tremolite, actinolite, chlorite, hallite, staurolite, millerite, bornite, chalcopyrite, malachite, chrysocolla, magnetopyrite, garnet, apatite, genthite, epsomite, chalcanthite, aragonite, zoisite, pyrophyllite, barite and one specimen of rutile in dolomite. Associated with the steatite is a rock occurring in vast quantity, the mass being steatite, with apparently nodules of serpentine scattered through. At times these show the crystalline form of staurolite, and they are, in part at least, pseudomorphs of serpentine after staurolite.

On the right bank of the river, besides the breunnerite, asbestos was at one time found in considerable quantity.

About a half mile above the soapstone quarry and a quarter of a mile westward from the river was Rose's quarry, in a hard black serpentine of the Lafayette belt. Here were found asbestos, enstatite, Schiller spar and antigorite.

On the Wissahickon, the line of demarkation between the Manayunk schists and the Chestnut Hill schists is obscure. Below Gorgas' Lane menaccanite in quartz occurred. Above Gorgas' Lane was found halotrichite. Near Cresheim Creek antholite in radiated masses is abundant, also staurolite and kyanite in the mica schists, in poor specimens, and garnets in great quantity but poor. Very recently fine kyanite was obtained. Where the steatite belt crosses, near Thorp's Lane, magnetite in octahedra, talc and steatite are found. Hyalite is found occasionally coating the schists.

On the Schuylkill, the tunnel of the Reading Railroad through the Manayunk schists at Flat Rock afforded fine specimens of red stilbite, also heulandite, beryl and calcite. On the left bank, nearly opposite the tunnel, were found brown spar and ilvaite. At Heacock's quarry in the Chestnut Hill schists at Jenkintown, North Pennsylvania Railroad, Mr. Edward D. Drown found an albite granite containing very minute green crystals which a microscopic examination proves to be torbernite. This is an interesting discovery.

Northwest of the Chestnut Hill schists is a hill, often of great height, and almost continuous from Trenton, N. J., to beyond the Brandywine. This is of Laurentian gneiss. It is, except in one place, singularly barren of crystallized or rare minerals. This exception is the well-known Vanartsdalen's quarry near Feasterville, in Bucks County, where a small bed of limestone is exposed and here we find many of the minerals found in the Laurentian limestones of Canada. This is the only observed out-crop of limestone in the whole length of the Laurentian in this part of the State. The rock is mostly granular and crystalline and much mixed with other minerals, particularly phlogopite, pyroxene and graphite. The following minerals have been found:—

Blue quartz, which, while abundant in massive specimens throughout the whole Laurentian range, was in specimens of unusually good color at this quarry; orthoclase, massive, of a gray color, translucent, almost transparent, with the cleavage surfaces very

brilliant; rarely it is beautifully opalescent, resembling labradorite, or even more closely resembling the microcline of Norway; muscovite, rare, of a bright emerald-green color; phlogopite abundant, but not in good specimens; wollastonite, massive, at one time abundant, but usually rare; garnet, massive, not common; pyroxene in its varieties, salite, fassaite; coccolite abundant; sphene in crystals up to an inch in diameter, some quite good, poor specimens abundant; scapolite chiefly in its variety ekebergite, but also in rough crystals, the former abundant; moroxite; zircon very rare, but in beautiful crystals; molybdenite has been reported from this quarry but I think graphite has been mistaken for it; gypsum in poor specimens formed by the action of decomposing pyrite on the limestone.

The graphite, phlogopite, pyroxene, etc., occurred in the limestone often in bands an inch or so wide and a few inches long and remarkably contorted; so much so, that sections roughly broken would occasionally closely simulate letters of the alphabet and the late Mr. Vanartsdalen used to exhibit with much pride the name "George Washington" in these natural stone letters remarkably perfect except in such details as the cross of the A.

In the Laurentian at Trenton and also at Camp Hill near Willow Grove small zircons occur, also, in many places loose in the soil. I know of no minerals in this belt elsewhere except the ordinary constituents of the gneiss: quartz, generally bluish or milky, orthoclase, a triclinic feldspar, hornblende, magnetite and garnet, and also, at one locality near Radnor Station in a trap, labradorite and hypersthene.

Northwestward of the Laurentian for nearly its whole extent is a limestone valley in which, or bordering it, are schists, those near the Laurentian very closely resembling the Manayunk and Chestnut Hill schists, and in many places near the limestone, unctuous clays carrying much limonite. In the limestone many quarries have been opened, some of them large and deep, especially along a line near the southeastern margin, where a bed of the limestone has been converted into marble. The explorations for iron ore have been more numerous than extensive, but in some places vast quantities have been taken out and used chiefly at adjacent furnaces.

At the limestone and marble quarries there is almost nothing of mineralogical interest: calcite in poor crystals, small quartz crystals, damourite in sheets and coatings comprise all, with the following exceptions:—

The most noted marble quarry is at Marble Hall, Montgomery County, on the Ridge Road about fourteen miles from Philadelphia. This yielded fine statuary marble and was wrought as an open quarry to a depth, I am informed, of over three hundred feet; near by lignite and iron pyrites occur.

It has been suggested that this marble is due to the alteration of the limestone by the Conshohocken trap dyke which is near its north-westerly side. Inasmuch as there is ordinary limestone between the marble and the dyke and the marble occurs also at a distance from the dyke as at Potts and Henderson's quarries, this view seems untenable. At Conshohocken, in the cut of the Schuylkill Valley Railroad, the trap dyke was almost if not quite in contact with the limestone, which showed no change from the ordinary limestone of the region.

Northeast of this was a smaller quarry in an inferior marble, and in this was once found a mass of barite of many tons weight almost indistinguishable from the marble except by its weight. It is a tradition that it was supposed to be marble until the hoisting tackle having parted three times successively while attempting to lift a not unusually large block, an investigation showed that it weighed one and one-third times the same bulk of marble. Carbonate of strontia was reported from this vicinity, but I think it a mistake.

Mr. Jefferis informs me that in 1837 fine crystals of dog-tooth spar were found in quantity at Marble Hall.

East of the Schuylkill between the limestone and the Laurentian, is a stratum of Cambrian sandstone forming during most of its course a prominent ridge, especially near Edge Hill Station, on the North Pennsylvania Railroad. In this rock, hematite occurs abundantly in brilliant cleavable masses, very rarely crystallized. It is slightly titaniferous, and was found by Mr. Edward D. Drown, upon land belonging to him near Weldon, to contain rutile in interesting specimens.

On the right bank of the Schuylkill, just above Conshohocken, Montgomery County, a large quarry known as Bullock's has been wrought for many years in a limestone much mixed with mica and graphite. The rock is tough and durable and is favorably situated for quarrying. It cleaves in one direction with facility and in the others it is divided by joints many feet apart, enabling stones of almost any size to be readily procured. This renders it the preferred stone in Philadelphia for heavy foundations and it has been

used thus in most of the larger buildings for many years. Minerals are rare in this rock. In seams, poor quartz crystals and pyrite occur, with occasionally small, but very perfect and beautifully modified crystals of calcite. In one seam, near the river, about 1866, a few remarkable crystals of calcite were found, being perfect and doubly terminated hexagonal prisms, with trihedral summits. Aragonite occasionally lines crevices, some specimens being of much beauty.

White cleavable calcite occurs. Phyllite was found in this limestone in 1864 near Plymouth. In the Chester valley fluorite occurs. At Potts' landing galena is said to have occurred in the limestone.

At the limonite mines adjacent to this limestone belt few minerals occur other than the limonite and that usually in specimens not worthy of a place in a mineralogical cabinet. An exception to this was a mine opened near the Edge Hill furnace on the North Pennsylvania Railroad in which at one time a deposit of geodes of limonite of exceptional quality was met with. At this time, besides the limonite, which was in beautiful specimens, the geodes were found lined with fine specimens of göthite, turgite and velvet manganese, psilomelane and braunite.

In 1855 at Colwell's iron furnace on the northeast bank of the Schuylkill at Conshohocken, a few very fine specimens of cacozenite were found. This came undoubtedly from the immediate vicinity, but from what particular spot could not be ascertained, as ore was hauled to the furnace from many openings.

In a thin stratum on both sides of the Laurentian and near it, hornstone or chert occurs, at times in large quantity, particularly northwest of Chestnut Hill, on the Roberts Road southwest of the Old Lancaster Road near Bryn Mawr, and on the Mattson's Ford Road west of Montgomery Avenue, on the line between Upper and Lower Merion, Montgomery County.

In the township of Upper Merion, close to King of Prussia, quartz crystals were exposed in a cut of the Trenton Cut-off Railroad, west of the road to Radnor. About two miles further east on the same road, and again about a mile from the Schuylkill a quartzose rock filled with cavities studded with quartz crystals was met with in great quantity. In a similar, if not the same, rock near Henderson Station, Chester Valley Railroad, occurred the fossils for which that locality is noted.

About half a mile east of Henderson Station pyrite altered into limonite occurs in good specimens.

Southwest of the Schuylkill, on each side of the Laurentian hill above mentioned, is a line of serpentine outcrops, beginning on the northwest side about three miles from the river and extending thence nearly in a straight line to a point northwest of West Chester. On the southeast side of the Laurentian there is a very small outcrop northeast of the Schuylkill. Southwest of the river, but close to it, is Rose's quarry before mentioned; thence the belt stretches southwestward almost continuously through Lower Merion, Radnor, Marple and Newtown Townships. On this belt few quarries or mines have been opened, Rose's quarry, as before mentioned, yielded enstatite, asbestos, Schiller spar and antigorite.

At Rosemont, where the Pennsylvania Railroad passes this belt, was a quarry, now built over, which afforded a fibrous aragonite.

Where the road from Philadelphia to West Chester crosses the railroad, about a mile east of Newtown Square, remarkable specimens of stalactitic quartz were once found in digging to lay the foundation of a stone wall. The cavities were from one to four inches wide and the stalactites depending, both in the ordinary form and also in curtain-like sheets, formed specimens of great beauty. Further southwest, in the same belt, was Moro Phillips' chrome mine referred to in Dr. Cardeza's notes.

Close by, but probably in a serpentine not connected with the Laurentian, antholite occurs in quantity and in good specimens.

In the belt northwest of the Laurentian, about one-half a mile northwest of Radnor Station, a quarry was opened on land then belonging to John Stacker. In this quarry, and in the vicinity, the following minerals were found:—asbestos, mountain cork, marmolite, chromite, chalcedony, cacholong, drusy quartz, deweylite, genthite, enstatite, dermatin (?), serpentine, pseudomorph after asbestos, quartz pseudomorph after asbestos, pimeleite, chrysotile, vermiculite.

In the mica schist of Cream Valley, about a mile northwest of Radnor Station, crystals of garnet sometimes an inch in diameter and usually distorted, associated with staurolite are abundant. In the limestone of the same valley, about a mile north of Radnor Station, small brilliant cubes of pyrite were at one time abundant, many of them curiously elongated and flattened.

In the Potsdam sandstone of Cream Valley minute tourmalines are abundant, occurring occasionally in crystals an inch or more in length.

LOCALITIES OF CHESTER COUNTY. BY WILLIAM W. JEFFERIS.

Four and a half miles northeast from West Chester in the township of Willistown, Chester County, there is a vein or bed of magnetite in serpentine, some of the specimens showing strong polarity. This was opened about seventy years ago for chrome ore and some five hundred pounds were taken out, but not being chromite the mining was abandoned.

The serpentine continues in a southwest course and is exposed in West Goshen Township, north of West Chester, for a mile or more. Three quarries have been opened for building stone. In one of them, on the farm of the late General George A. McCall, is found chrysotile in small veins.

A few hundred yards west of this is the quarry of William P. Marshall, that has furnished many cabinet specimens of aragonite in small radiated crystals. In seams of the serpentine, dolomite and marmolite are also found.

On the adjacent ridge, drusy quartz was formerly very abundant, also chalcedony and jasper.

At the end of the serpentine ridge, west of Marshall's quarry is a vein of compact talc that was worked by an old mineralogist in 1834, with an idea of making pencils and supplying lyceums with specimens. North of this, on the edge of the serpentine, staurolite and garnets occur.

Half a mile further west is Taylor's quarry and from it have been taken the following minerals:—radiated aragonite (called by the old mineralogists of 1820, radiated carbonate of magnesia), deweyite, kerolite, asbestos, and chromite in octahedral crystals. In the road north of Mr. Taylor's house, staurolites and garnets were formerly abundant.

On the farm of Caleb S. Cope, in East Bradford Township, one mile west from Taylor's, is found talc, some of the specimens containing yellow actinolite. Epidote in quartz also occurs. A short distance west from the talc locality is an old quarry of magnesian limestone which is very fetid when struck.

In the edge of the quarry was found necronite and also cyanite of a fine blue color, which at one time was quite plentiful in an old dam breast adjoining.

Gray cyanite in crystals occurs in a bed of mica schist at both ends of the bridge over the Brandywine at Cope's in East Bradford Township. Blue and green cyanite are also found in the rocks

near and scattered over the fields for the distance of two miles west of the bridge.

On the hill seventy-five yards west of the old Black Horse Tavern in East Bradford Township (in the road) there is a compact talc of a very fine quality which was exposed some four feet in length by two and a half inches in thickness. This appears to occupy fissures in the hornblende rocks along which there has been a motion of the adjacent parts evidenced by the slickensided surfaces of this talc.

In Newlin Township, five miles southwest from the Black Horse locality, there is a large outcrop of serpentine in which numerous lumps of corundum have been found, one of them, lying on the surface, weighed 5,200 pounds. On the north side of the ridge a number of excavations have been made from which several tons have been taken in small pieces. In one of them was found a vein or stratum fourteen feet long by seven feet in breadth and fifty-four feet in depth, a solid mass of corundum and emerylite; on one side of it was a coating of diaspore, three by two feet and two inches thick, well crystallized on the surface, some of the crystals being two inches long. The other minerals found there were lesleyite, pattersonite, gibbsite, indianite, antigorite and spinel. The locality of corundum was first discovered by the digging of a well on the hill south of this, the crystals being found in a decomposed albite. The well was re-opened in 1844 for corundum but was found unproductive and was discontinued after going down fifty feet. Since then a shaft has been sunk near by to the depth of one hundred and fifty feet, with considerable drifting on a vein, and a number of tons of mineral taken out, said to be from a true vein or stratum. This is now worked by a Philadelphia company, with success.

On the same ridge of serpentine, 500 yards east, a quarry of feldspar was opened and several carloads of it sent to the potteries at Trenton. It was highly cleavable and furnished many fine cabinet specimens, also large crystals of tourmaline, garnets and muscovite.

One half mile east of the corundum locality, at the end of the ridge of serpentine, crystals of beryl of green and yellow colors were found abundantly in the soil; one terminated crystal weighed fifty-one pounds. This appeared to come from a vein of quartz and mica in the serpentine.

A short distance southwest from the corundum works a shaft has been sunk and a few tons of the mineral taken out. When first

opened some of the corundum contained the rare mineral euphyllite.

There are no minerals of any note in the serpentine until we reach the southern part of the county where sand chrome occurs in abundance, and thousands of tons have been taken from the soil. Hallite in hexagonal crystals occurs in a vein in East Nottingham Township, also a hard asbestos in stick-like masses two feet long.

In West Nottingham Township, crystals of chromite in octahedrons, roseite (a variety of jefferisite) staurolite, leelite and magnesite occur. Several excavations have been made in search of the latter mineral and many tons of it were sent to Philadelphia to be used in the manufacture of epsom salts.

In the adjoining county of Lancaster, one-half mile from the Maryland line is the celebrated chrome mine known as "Woods' mine." The mine was opened about the year 1835 or 1840, and many thousand tons of chromic iron have been taken from it. The vein was traced to the depth of 700 feet, and in some places was 30 feet thick. It has not been worked for the past ten years, and is now abandoned, and filled with water and debris. About the year 1858 or 1860 brucite was found in abundance, finely crystallized; one of the veins of brucite being a foot in thickness. The following minerals also were found at this mine:—zarate, kammererite, penninite, deweylite, ouvarovite, picrolite, genthite, baltimorite, dolomite, hydrodolomite, aragonite in delicate radiated crystals and hematite in very fine crystals with penninite. All the minerals found within five miles of the mine have been labelled from Texas, as follows:—williamsite, enstatite, lancasterite, talc, magnetite crystals in chlorite, green tourmaline, limonite pseudomorph after pyrite in modified crystals, steatite, carnelian, jasper, moss agate and drusy quartz.

In the western end of the township of West Town, three miles south of West Chester is the celebrated Birmingham serpentine quarry, perhaps better known as Brinton's quarry. The stone has been used in the principal cities of the United States. The following occur in the quarry:—clinochlore and jefferisite in finer specimens than elsewhere; deweylite, tourmaline, beryl, magnesite, talc, aragonite, in radiated crystals on the serpentine, covering surfaces three by two feet or more; oligoclase, showing fine twinning lines; magnetite, amethyst, etc. The crystals of clinochlore, are found in pockets of talc in the solid serpentine, partially decomposed.

There is also an outcrop of serpentine two and a half miles southwest of West Chester with a vein of aquacryptite through it. This

mineral when immersed in water decrepitates with considerable noise. This locality is in East Bradford township, and amethysts are found in nearly all the fields within half a mile of it.

Half a mile northwest from the Birmingham quarry is Osborn's Hill, in which a mine was opened about the year 1835 for manganese, and half a ton of the black oxide taken from a depth of thirty feet. The vein stone was massive manganesian garnet containing crystals of yellow sphene. Tourmaline, in small crystals in quartz, occurs abundantly, also orthoclase crystallized, on the west side of the hill.

Very few minerals have been found in the hornblende rocks of Chester County, the principal ones being zoisite at the old water works in West Chester, now inaccessible; labradorite, sphene and sunstone, the latter of great brilliancy, were found at Lamborn's mill, one-half mile southeast of Kennett Square; epidote crystals occurred loose in the soil one mile south of the borough; sunstone is also found near Fairville. One-half mile north of Fairville, on the farm of the late William Dilworth, muscovite crystals occur by the hundred in the soil northwest of the house, near the woods.

One-half mile south of Pennsville, on the farm of Jacob Swayne, there is a large deposit of white quartz containing a few crystals of feldspar, and large crystals and plates of muscovite beautifully marked by magnetite and containing compressed crystallized quartz, suitable for the microscope. Some almost perfect crystals from this place measured eighteen inches by twelve or more. A large quantity of merchantable mica was obtained.

In quarrying for limestone in Chester Valley they occasionally find openings or small caves filled with stalagmites and stalactites, some of the latter being a foot or more in length; a few brilliant crystals of pyrite are sometimes found in the limestone, also fluorite and quartz crystals; at the Pennsylvania Railroad quarry, East Caln Township, ankerite.

In the limestone on the Brandywine Creek, about a mile above Chadd's Ford, occurs chondrodite, the only locality of this mineral in the region.

The quarries in West Bradford Township, known as the Poor-house quarries, were opened nearly one hundred years ago and are in a magnesian limestone; in it are found the following minerals:—chesterlite, quartz crystals, rutile in needle-like crystals, some transparent and of a dark ruby color; tremolite and a yellow damourite

in delicate tufts or rosettes. Some two miles to the southwest are the Doe Run lime quarries. These have been extensively worked for over half a century. In them have been found rutile, tremolite and fluorite, the latter only as a thin crust of a deep purple color.

In West Marlborough Township, two miles west of Unionville, are Bailey's lime quarries, containing bladed mussite, crystallized and fibrous tremolite in quantity. Brown and yellow tourmaline in small crystals have also been found in this township.

Limestone has been quarried extensively near the village of Avondale in London Grove Township. Aragonite, brown tourmaline, mountain leather, tremolite and very fine crystals of calcite are the only minerals found in these quarries.

Some years ago a large quarry was opened in the gneiss rocks at Avondale, known as the Toughkenamon hills, and in it bright red iron garnets in dodecahedral crystals were found by the hundred, some of them being three and one-half inches in diameter, also good crystals of tourmaline. A small specimen of graphite was found in this quarry.

Pyrite more or less altered into limonite of a shining dark brown color in cubic crystals of all sizes up to one and one-half inches in diameter are found loose in the soil in the township of East Whiteland and Tredyffrin in abundance; these are sometimes pure limonite.

In the year 1850 an iron mine was opened on the farm of the late Gen. Trimble, in East Whiteland Township, and at the distance of ten feet below the surface was found a horizontal vein of wavellite in stalactites, also radiated and occasionally crystallized. After a few years the mine was abandoned and the locality lost for a time. A shaft or well has since been dug twenty-five feet, striking one of the old drifts and from it were taken a few very fine specimens. Cœruleolactite was found in abundance when the mine was first opened, but as it was thought of no value it was dumped into the excavations left in mining the iron ore and many fine specimens were lost to science.

Rutile, or the mineral known in Sadsbury Township as money-stone, is found loose in the soil for the distance of seven miles along the Chester Valley and particularly near the village of Parkesburg on the farm of Horace A. Beale where crystals have been found weighing three quarters of a pound.

In Uwchlan Township half a mile north of the Eagle tavern massive blue quartz is found in abundance. Graphite is now being mined quite extensively east of the tavern.

A number of iron mines were opened in the vicinity of Kimber-ton and Yellow Springs, fifty years ago, and many fine specimens of limonite were found, also a half ton or more of a jet black limonite known as melanosiderite. A fine specimen of allophane was found in one of the mines near, and is now in the Vaux collection. It is the only one known from Chester County.

A deposit of limonite was found in West Whiteland Township adjoining the quarry known as Thomas' marble quarry, worked to the depth of 180 feet in the year 1836, and after a few years abandoned. The ore is principally of the variety known as pipe iron ore, but some of it is of a rather different character, for the stalactites or pipes instead of being radiated in structure were composed of concentric layers, making a pipe within a pipe. The deposit being of a very limited extent was soon worked out, and now no trace of it remains.

The following minerals have been found at the Warwick mine holes, at the village of St. Mary's:—magnetite in dodecahedral crystals; actinolite, in small radiated geodes, and a jet black melanite garnet in geodes, with a reddish mineral, said to be orthoclase.

One mile west from St. Mary's are the old Hopewell mines, the ore being magnetite crystallized in octahedrons, with an occasional group of pyrite, and quartz pseudomorph after pyrite.

One-half mile north from the village of Knauertown are the celebrated mines known as the Mines of French Creek, being first worked as Keim's iron mine, afterwards as the Elizabeth copper mines; now being mined for iron. The ore is magnetite mixed with pyrite. Bright pyrite in octahedral crystals with numerous modifications occurs in the vein or wall of calcite; there is also a vein of chalcopyrite adjoining the iron ore vein. The chalcopyrite is crystallized where it adjoins the calcite, making the finest specimens of the mineral known to mineralogists. It also occurs in perfect, isolated tetrahedra. Besides the above the following minerals occur: calcite crystals, aplome garnet, stilbite, apophyllite in remarkable specimens, byssolite, erythrite, hornblende and a feldspar pseudomorph after natrolite.

At the lead mines near Phoenixville, known as the Wheatley and Brookdale mines, the following have been found:—anglesite, cerusite, pyromorphite, wulfenite, descloizite, mimetite, galenite, native cop-

per, chalcopyrite, malachite, azurite, sphalerite, calamine, laumonite, calcite, fluorite, limonite, native sulphur, oxide of manganese, pyrite, barite, covellite, quartz and dolomite, melaconite, quartz pseudomorph after calcite, ankerite.

LOCALITIES OF DELAWARE COUNTY. BY J. T. M. CARDEZA, M. D.

The chief localities for minerals in Delaware County occur in gneissic beds, many of which are isolated in areas of more schistose rocks, or in or near the serpentine outcrops which abound in the central part of the County.

Perhaps the more prolific localities have been in or near the Townships of Ridley and Middletown.

Ridley Township. East of Chester and north of the River Delaware, large quarries have been wrought for many years chiefly in fine grained micaceous gneiss of considerable value for building purposes and for curbstones. Of these Deshong and Leiper's on Ridley Creek and Leiper and Lewis' on Crum Creek are most noted. The gneiss itself contains rarely small garnets and tourmaline, the rarer minerals occurring in coarse granitic veins, beds or segregations in the gneiss.

At Deshong's quarry, as at Leiper's on Ridley Creek, the two being in the same bed, good-sized brilliant garnets have been found together with beryl in hexagonal prisms one-eighth of an inch to one and one-half inches in diameter and from one inch to twelve inches in length, usually pale green and translucent, occasionally bright green and transparent, and a number with fine well terminated crystals. I have a specimen in my cabinet with replacements of the prism faces giving it the appearance of a cylinder. Small well terminated crystals of yellow beryl were found here.

Beryls, some terminated, altered into a granular white substance were recently found. I have in my possession a beryl from this locality, one foot long, two inches in diameter, lying on a bed of crystallized feldspar. Some very fine specimens of tourmaline occur, but being very fragile, are rarely obtained entire; muscovite is abundant but poor. Autunnite and torbernite, in good specimens, in coarse granite, have been obtained; also more rarely uranochre. Fine crystals of orthoclase of different forms have been found, both singly and in groups, the crystals from one-half an inch to six or eight inches in length. In a pocket was found thulite of a beautiful pink color; of this there were very fine specimens, some honeycombed and some

with a few small crystals. Leidyite, a hydrous silicate of iron, is found in granular masses. I have noticed a similar occurrence at Jones' Falls, Baltimore. I allude to the presence of chabazite coated with leidyite and leidyite pseudomorph after chabazite, making haydenite. In Deshong's quarry, in connection with the leidyite, are the same zeolites as at Jones' Falls, viz.: stilbite, heulandite and a few small specimens of beaumontite. In this pocket some small but good crystals of chalybite occurred. Ward's quarry, about one mile above Deshong's, between the Philadelphia Pike and the Delaware River, is similar in geological characteristics and is largely wrought for its stone. Stilbite is found in fine, large radiations.

The quarry of Leiper and Lewis, at Avondale, on Crum Creek, affords very fine garnets, some as much as two or three inches in diameter, as well as very brilliant smaller ones, also tourmaline in terminated crystals, but occurring usually in sections of about one inch to one and a half inches in length, a stratum of granular quartz, a quarter inch or less in thickness, breaking the continuity of the crystal. Good crystallized orthoclase and beautiful crystals of adularia are found in groups in which are sometimes found small, pale green, or nearly white beryls, well crystallized, with modified terminations. A few terminated yellow beryls have also been found. Mr. Rand reports having collected in this quarry, chalcopryrite, malachite, chrysocolla, hyalite of a bright green color, uranochre, uraninite and bismutite, the last three in very small quantity. Miss M. A. Holmes reports pink zoisite or thulite. At Folsom is a small quarry opened for cellar foundation-stone, in which some good garnets were recently found, one in my possession being as large as a man's fist. In a quarry near Leiperville, owned by John Deshong, but not at present worked, owing to the hardness of the stone (a hornblende gneiss) some pretty garnets, one-half to three-quarters of an inch in diameter, were found in a schistose bed in the gneiss, with also stilbite of a yellow or orange color and in radiations one and one-half to two inches in diameter.

At Bullen's Lane, on Ridley Creek, a quarry, now owned by James Irving but not at present worked, has yielded some very fine crystallized orthoclase in modified forms, some very fine garnets from one inch to one and one-half inches in diameter, crystallized muscovite in quartz, looking as if subjected to enormous compressing force,

the basal planes being rounded and the crystal being not unlike stone arrowheads in form.

Chester Township. In the village of Upland on Chester Creek near Chester, in a quarry formerly worked by Henvis, chabazite of a red color was found. One specimen in possession of Michael Bradley of Chester has with the chabazite, pectolite. Some good crystallized orthoclase of a flesh color was found.

On the Samuel Felton farm, Thurlow, is an altered natrolite in a schistose rock.

At Ship Creek, a tributary of Chester Creek, near Upland in Samuel Crozer's quarry, garnets coated with autunnite, and one fine doubly terminated crystallized orthoclase was found.

In Shaw and Esray's quarry, near Chester, have been found tourmaline, garnet (one as large as a man's fist) crystallized orthoclase, beryl, mostly in process of alteration, but good crystals of a pale green color; smoky quartz in large crystals. I have one in my possession, fourteen inches long, one foot wide and about seven inches thick, two planes of the prism being developed at the expense of the four remaining. An amethyst of the same size and form was also found here. Some good amethysts are found of a deep purple color, also smoky quartz, in crystals six to eight inches long, and three to four inches in diameter encrusted with well crystallized amethysts of good color; also a peculiar feldspar in crystals six to eight inches long and four to six inches across, having the appearance on the surface of having been eroded.

At Cartertown, farm of Peter Green, near Chester, is the old Chester molybdenite locality on Chester Creek above Upland. A few crystals of this mineral were found, with a considerable quantity of the massive mineral, disseminated in quartz, but at present it is scarce. Molybdenite occurs with it (Rand). In the same vicinity was sillimanite. A crystal of beryl, of a pale green color, terminated, four inches long, one and a quarter inches thick, was found here in a boulder of granular quartz, and is now in my possession. On this property, on the creek shore, a mine was opened some years ago for copper, but very little sulphide of copper was found, and the mine was abandoned as it required constant pumping.

At Bridgewater, on Chester Creek near Upland, in one of the quarries of John Mullen, in a pocket in the schists, several fine large crystals of sphene occurred, of a yellow and also of a light green

color, some two inches in length. None have been found since, in spite of diligent search.

Darby Township. On Bethel Custer's farm, Glenolden, are good blue kyanite in long blades, and sillimanite.

On the Philadelphia Turnpike, below White Horse tavern, in a ditch on the west side of the road, blades of kyanite occur abundantly, washed out by rains from a schist.

On the farm attached to the White Horse tavern, are gray and blue kyanite and sillimanite.

In digging the cellar and foundation for a barn, on a farm opposite the White Horse tavern, several large boulders of kyanite were found, of a beautiful blue color with blades six to eight inches in length. Along the little stream emptying into Darby Creek at Morris' Ferry, many loose masses of kyanite have been worked out. At Morris' Ferry, in the creek at low water, garnets of good quality have been found in the mud.

Near Landsdowne, smoky quartz, loose in the soil. Mr. Rand has a crystal measuring nine by seven inches.

Near Darby, titaniferous garnet.

At Upper Darby, in a cutting of the proposed Chester County Railroad, Babel quartz and modified quartz crystals, orthoclase crystals.

Nether Providence Township. On the farm of George Sharpless, on Providence road above Shoemakerville about three miles above Chester, a small quarry was opened for stone to pike the road leading to Media, and some remarkable crystals of feldspar doubly terminated and variously modified were found, some eighteen inches by twelve inches were taken out, and at present several are in my possession; also green mica in pretty specimens. In digging a post hole opposite the mansion, a pocket of amethyst was discovered. About a half dozen fine crystals, one and a half to two inches in size and of a deep purple color were obtained.

Near Swarthmore College, andalusite and black tourmaline, not terminated, but the whole crystal tapering from the base in a long cone shape, are found, also orthoclase.

Howard Lewis' farm. Andalusite, tourmaline, yellow beryl. The andalusite crystals were imbedded in quartz, some very large crystals were obtained and some remarkably perfect. A group in the collection of Mr. Theo. D. Rand contains one crystal nearly

perfect on three of its four prismatic planes, and perfectly terminated at both ends.

Upper Providence. On Thomas Reese's farm, orthoclase, cassinite, sunstone and moonstone in striated oligoclase, corundum.

At Blue Hill, prase in magnificent specimens, asbestos, chrysotile in fibres two, and two and one-half inches in length, actinolite, drusy quartz and chromite in large crystals.

Lower Chichester and Vicinity. On farm of William Trainer, on a knoll near the Linwood mill dam, were found crystals of orthoclase and tourmaline, and large crystals of beryl of a pale green color, some mottled yellow and green externally and pale green internally, opaque, two inches in diameter. I have in my possession a specimen from this place, one foot in length and an inch and a half in diameter, with another crystal, about six inches long and one inch in diameter attached to it at right angles, I have also a specimen two and one half inches in diameter with replacements on the termination. This beryl occurs in a granular quartz, in boulders one to ten feet below the surface, although large specimens have been ploughed up on the surface. There is a deposit of good kaolin near the spring house on the same farm.

In quarry of Benjamin Johnson, garnets.

On Robert Loughhead's farm, kaolin.

On farm of Matthew Boyd, some specimens of blue kyanite have been found.

Upper Chichester. A few good garnets, of the spessartite variety, about one inch in diameter, were found in the feldspar quarry of John B. McCay, on the north branch of Naaman's Creek.

On the same farm, in a wash-out of the Baltimore and Ohio Railroad, many fine spessartite garnets were found in a feldspar deposit which occurred in broken blocks, presenting almost the appearance of masonry; some good sphene of a yellow color, from a half inch to one inch in length, are also found here.

In the same neighborhood, on the farm of J. B. Okie, amethyst crystals have been found. Of these one has been cut and mounted as a gem.

Farm of John Carrol, adjoining that of J. B. Okie, a quarry of feldspar, for the manufacture of porcelain and for dental purposes, has been opened.

Near Chelsea, on the farm of Stephen White, green garnet, gahnite, and flattened garnet, in mica occur.

Aston. Farm of Wm. Hannum, near Village Green, a large deposit of asbestos of good quality is found and is about to be mined.

On Judge Tyson's farm, near Village Green, acicular tourmaline.

On Brown's farm, adjoining Judge Tyson's, bronze corundum, corundum passing into margarite, and margarite pseudomorph after corundum.

An old and prolific deposit of amethyst was on Chester Creek near Dutton's mill. A vein runs across the road which leads from Judge Tyson's to Dutton's mill, and large numbers of crystallized amethysts have been dug out for years and probably by deeper digging many more can be secured. This amethyst is of a beautiful purple color. A new road was laid out a few years ago along Chester Creek from Upland to Dutton's mills on the east side of the creek, and on the McCall farm a pocket of fine amethyst of good color was found. On the farm connected with the Dutton's mills are boulders of antholite. On farm of Thomas Pancoast, asbestos.

North of Dutton's mills some remarkable crystals of muscovite were found.

At Llewellyn, staurolite.

On John Halberst's farm, enstatite, drusy quartz, hornblende. Near Morgan Station, quartz crystals, modified, with implanted minute crystals of ruby colored rutile.

Bethel Township. On a farm at one time occupied by James Lancaster a large deposit of granular garnet is now largely mined by a company for the manufacture of sand paper. It is said to be a very superior article. Some gems have been found here. At Green's Creek above Chelsea, garnets have been washed out of the sand of the creek bed. Some fine gems have been cut from garnets from this locality.

Concord. About one mile above Chelsea, on the farm of Harry Hannum, a large rock about twenty feet in diameter and about ten feet high rose up solitary on the lot. This rock consisted of antholite in radiations from three to four inches in diameter. It presented a peculiar and striking appearance before it was partly blasted away.

On the Singer farm, antholite and enstatite were abundant, clinocllore also occurs.

On Samuel McClellan's farm, asbestos, clinocllore, tourmaline.

On Mary Palmer's farm, bronzite, diacrasite, a beautiful mineral in yellow fibres one to two inches long. Of this mineral Dana gives

no American locality. Enstatite and antholite in pretty varieties are found.

On Randolph farm, Rose tree, amethyst in the soil, a manganese sand.

On James Worral's farm, andalusite, fine large crystals, some large groups. A crystal, nine inches long two and one-half inches thick, is in the possession of Joseph Willcox. Very fine crystallized amethyst, two and a half inches by eight inches, and many smaller ones of a deep purple color, beryl, apatite, tourmaline have also been found.

Morgan Hunter's farm near the Rose Tree Inn, andalusite, several fine crystallized amethysts. I have one from this locality three by three inches of a deep blue color; amethyst after andalusite; antholite after andalusite.

Middletown. On Joel Sharpless' farm, a quarry was opened about five years ago for feldspar and a considerable quantity taken out, when it was abandoned. A very large deposit of mica, transparent and colorless except for some included magnetite markings, was found and utilized for stove doors. Beautiful microscopic crystals of quartz occur occasionally between the laminae, also very pretty flattened crystalline films of quartz. Beryls mostly altered entirely or in process of alteration, terminated or in terminated sections, varying from one inch to nine inches in diameter, and from one inch to fifteen inches in length were found. I have one in my cabinet, seven inches in diameter and fifteen inches in length, very little altered, terminated and of a pale green color, but opaque. Gahnite in small crystals was found, also small flattened green garnets. Rand reports finding rose quartz near the quarry; along the road adjoining Isaac Evans' farm occur orthoclase and muscovite.

On Albert Darlington's farm, orthoclase.

On Humphrey Marshall's farm, amethyst in a quartz vein in hornblende rock, rutile in crystallized amethyst.

On John Tyler's farm, Dismal run, crystallized rutile, sillimanite, vermiculite in small crystals, ferruginous quartz, prase in mammillary masses.

At Bishop's mill, garnets, some very fine ones, two inches in diameter, plumose mica.

On Walker Yarnall's farm, cassinite, smoky quartz, some good specimens.

On Edward Smedley's farm, large boulders of corundum, asbestos, talc, muscovite, translucent across the prisms.

On George Williams' farm, corundum.

On John Smedley's farm, a few fine crystals of corundum.

On Phillip Mullin's farm, near Black Horse, some fine crystallized corundum was ploughed up in the soil, and collected after heavy rains.

In the ditch, on the west side of the road, going towards the Black Horse, and opposite the Mullen farm, many crystals of corundum have been picked up, washed out after heavy rains.

On a farm opposite P. Mullen's, corundum in albite has been found. A large pit was sunk and crystallized corundum, of a gray color and of a good quality for commercial purposes, was obtained. Many doubly terminated crystals from one to two inches long were found.

On Ahinam Smedley's farm, corundum, albite, beryl, (some good ones), columbite, fergusonite, asbestos.

At Mineral Hill, farm of Lewis Moore, rock chrome, abundant.

In Crump's Mineral Hill serpentine quarry, magnesite, chlorite, deweylite, talc.

On John Smith's farm, near Black Horse, beryl, of a dark emerald-green color, in good crystals, out of which some gems have been cut. Albite, vermiculite, tourmaline, sunstone, moonstone, columbite have also been found. A pit was dug for corundum and good specimens obtained; fibrous hornblende, actinolite of various shades of color, and enstatite, have been collected.

Near Institute for Feeble Minded Children, stilbite, drusy quartz, hypersthene.

At the "old chimney," north of Crump's quarry, was a small quarry for green feldspar yielding fine cleavage masses of a beautiful green color; some good crystals were found, but all more or less weathered. Sunstone, moonstone, columbite, a vein half an inch to an inch thick of an undetermined black mineral have also been collected.

On Robert Moss' farm, garnet and staurolite, in schist.

On Walter Beatty's farm, hornblende, titaniferous iron.

On William Bonsal's farm, smoky quartz, actinolite, drusy quartz.

On Charles Mills' farm, enstatite, marmolite, asbestos, boulders containing clinocllore.

On Samuel Jackson's farm, radiated tourmaline.

On Rev. Mr. Ross' farm, pyrite.

On Samuel Wells' farm, magnetite.

On Mathew Dobson's farm, rutile.

On Jesse Hibbard's farm, near Black Horse, chrome sand in washings containing good crystals, and rarely brookite. Actinolite of a deep green color. Moonstone in very fine specimens, stalactitic magnesite, bronzite, corundum in albite.

On road leading from Lima to Wawa, amethyst.

On Media Railroad, near Williamson school, chrysolite.

On Christian Scherz's farm, Black Horse, a peculiar chromic iron and hematitic iron intermixed with corundum.

At Edgar Tyson's Black Horse Tavern, on road going towards Rockdale, one hundred and fifty yards below blacksmith shop, corundum.

Several mines have been started in Middletown of late years for iron ore but have been abandoned, the ore not proving abundant. Some good showy specimens of limonite were found.

At Lenni, at the deep cut of the Media Railroad, vermiculite of a deep green color, also of a bronze and a white color. Leelite, lennilite, delawarite and actinolite, also several masses of small quartz crystals of a pale green color were collected. A serpentine quarry was opened here.

Edgemont. On Alfred James' farm, beryl.

At and near Castle Rock, enstatite, asbestos, chrysotile, talc, limonite in fine specimens showing fibres three inches long, ferruginous quartz, some closely resembling compostella quartz, also, in cavities of honeycomb quartz, microscopic quartz crystals doubly terminated and bright red in color. Under the microscope the crystals are colorless and transparent but each contains a minute red speck which colors the whole to the naked eye. These make beautiful microscopic objects.

Marple. On Major Jones' farm chromic iron.

On Abby Worrall farm, andalusite, some good specimens; in the public road near the mansion, amethyst.

On Samuel Sharpless' farm, andalusite, tourmaline.

On Albert Worrall farm, tourmaline.

On all the farms passing north, andalusite.

Radnor Township. Moro Philips' chrome mine, chromite, garnet, sphene, asbestos, steatite, limonite, magnetite.

Passing north into Radnor enstatite and asbestiform antholite and antholite containing bronzite and diacrasite are found.

On Mary Palmer's farm in the triangle between the Coopertown-Newtown road, Roberts road and Chester and Radnor road, antholite is abundant.